Technical Performance Measurement (Program Level)

Purpose of TPM

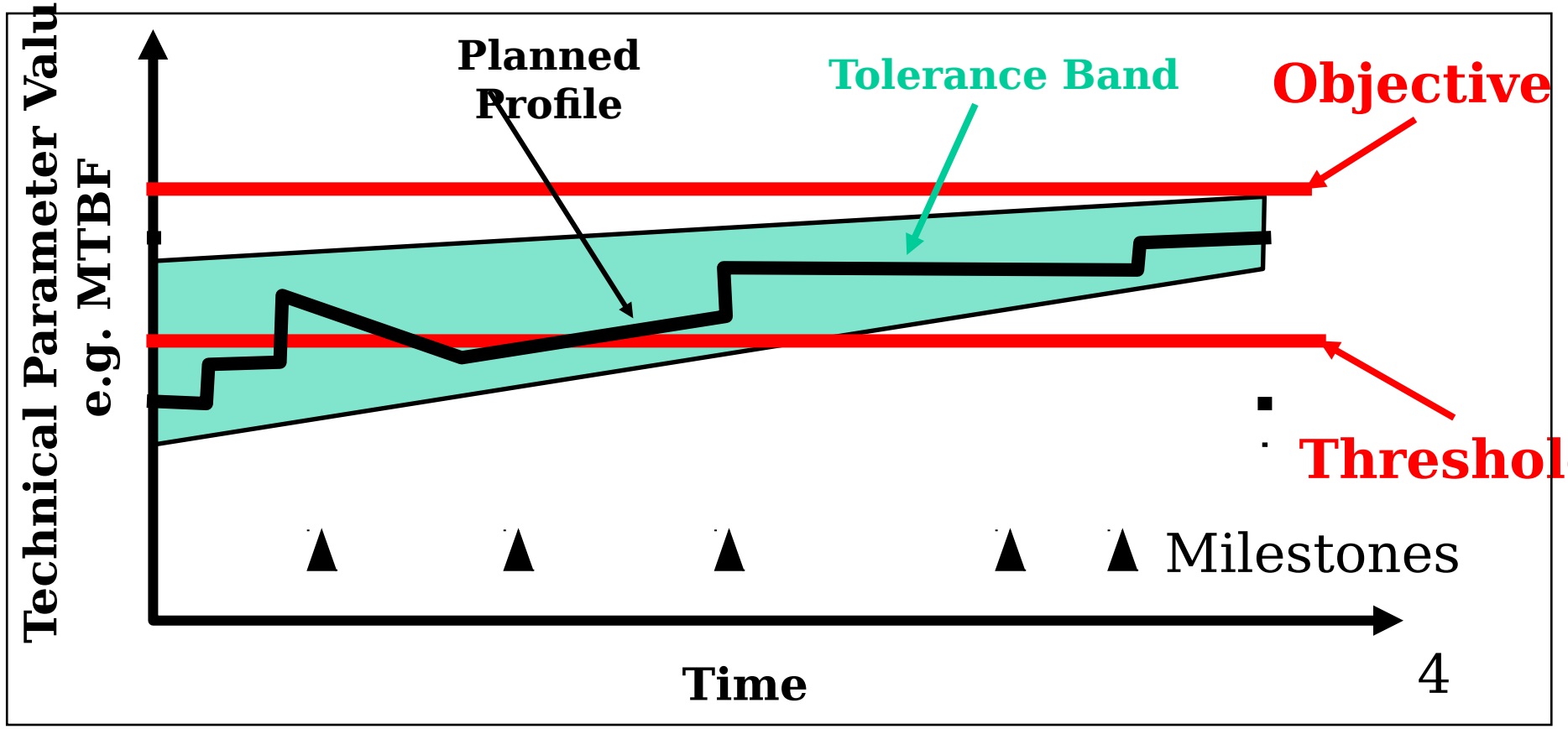
- **Monitor the technical risk of a program**
  - Provide early and continuing predictions of the effectiveness of risk-handling actions, or the detection of new risks before irrevocable impacts on the cost or schedule occur.
- **Provide early detection or prediction of problems which require management attention**
  - Confirm progress and identify deficiencies that might jeopardize fulfillment of a system requirement.
- **Support assessment of the program impact of proposed change alternatives.**

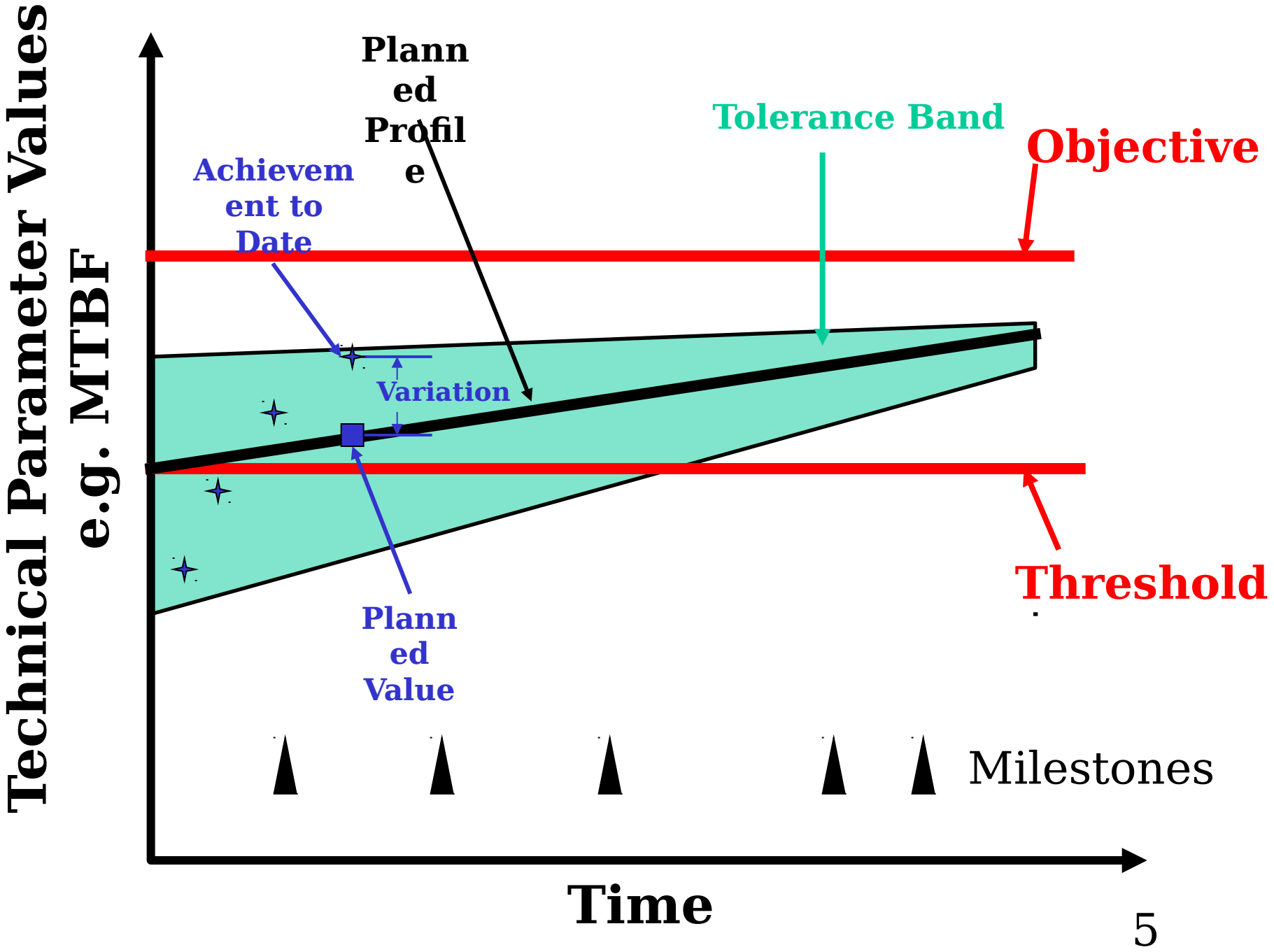
Technical Performance Measurement

- **During development, the comparison of:**
  - Technical performance (estimated or actual), and
  - Planned performance

Time-Phased Profile

Develop technical thresholds for each performance parameter that can be tracked over time while the system is being developed.




Technical Parameter Values
e.g. MTBF
Planned Profile
Achievement to Date
Tolerance Band
Objective
Variation
Threshold
Planned Value
Milestones
Time

Definitions

Achievement to Date - present achieved value of the technical parameter based on estimates or actual measurement;

Current Estimate - the value of the technical parameter predicted to be achieved by the end of the technical effort with remaining resources (including schedule and budget);

Technical Milestone - a point where TPM evaluations accomplished or reported;

Planned Value Profile - the projected time-phased achievement projected for the technical parameter from the beginning of the development or as replanned as a result of a corrective projection;

Tolerance Band - an envelope containing the Planned Value Profile and indicating the allowed variation and projected estimation error;

Objective - the goal or desired value at the end of the technical effort;

Threshold **-** the limiting acceptable value that, if not met, would jeopardize the project;

Variation **-** the difference between the planned value and the achievement -to-date value.

Relationship to Cost and Schedule Performance Measurement

- **Cost/schedule performance measurement assesses the program effort by comparing the planned value of work accomplished with**
  - **Planned value of work scheduled (schedule variance)**
  - **Actual value of work accomplished (cost variance)**
- **Cost and schedule performance measurement assumes adequacy of design to meet technical requirements of the system element under consideration**
- **TPM is the complementary function to verify such adequacy**

TPM and cost/schedule performance measurement are complementary in serving the purpose of program performance measurement.

Contractor TPM Requirements

TPM is a best commercial practice:

- **EIA/IS 731, Systems Engineering Capability Model (SECM)**
  - FA 2.2 Monitor and Control

    Technical performance metrics are used to track key technical parameters throughout a development program…
    - SP 2.2-2-1 Track… technical performance measurements against the plan.
    - SP 2.2-3-1a Periodically collect and analyze the measures of program and technical performance.
    - SP 2.2-3-1b Implement corrective action when measures deviate from expected results.
    - SP 2.2-3-4 Analyze and use prediction based on the program's measures to determine if the program's completion is at risk and warrants corrective action.

Contractor TPM Requirements

TPM is a best commercial practice:

- **EIA 632** September 1998 draft:
  - "The developer shall define a technical effort… The developer should plan and do the appropriate tasks to complete this requirement. Tasks to consider include the following: …
    - f) Identify technical performance measures that will be used to determine the success of the system, or portion thereof, and that will receive management focus and be tracked using Technical Performance Measurement (TPM) procedures."

CAO Requirements

- Perform engineering **surveillance to assess compliance with contractual terms for** schedule, cost, and **technical performance** in the areas of design, development, and production. (FAR 42.302a(40))
- Evaluate for adequacy and **perform surveillance of contractor engineering efforts and management systems** that relate to design, development…. (FAR 42.302a(41))

DOD Regulation 5000.2

- System analysis and control activities shall be established to serve as a basis for evaluating and selecting alternatives, measuring progress, and documenting design decisions. **This shall include the establishment of performance metrics to provide measures of how well the technical development and design are evolving**
  (1) **relative to what was planned** and
  (2) **relative to meeting system requirements in terms of performance**, risk mitigation, producibility, cost and schedule.
- **Performance metrics must be traceable to performance parameters identified by the operational user**.

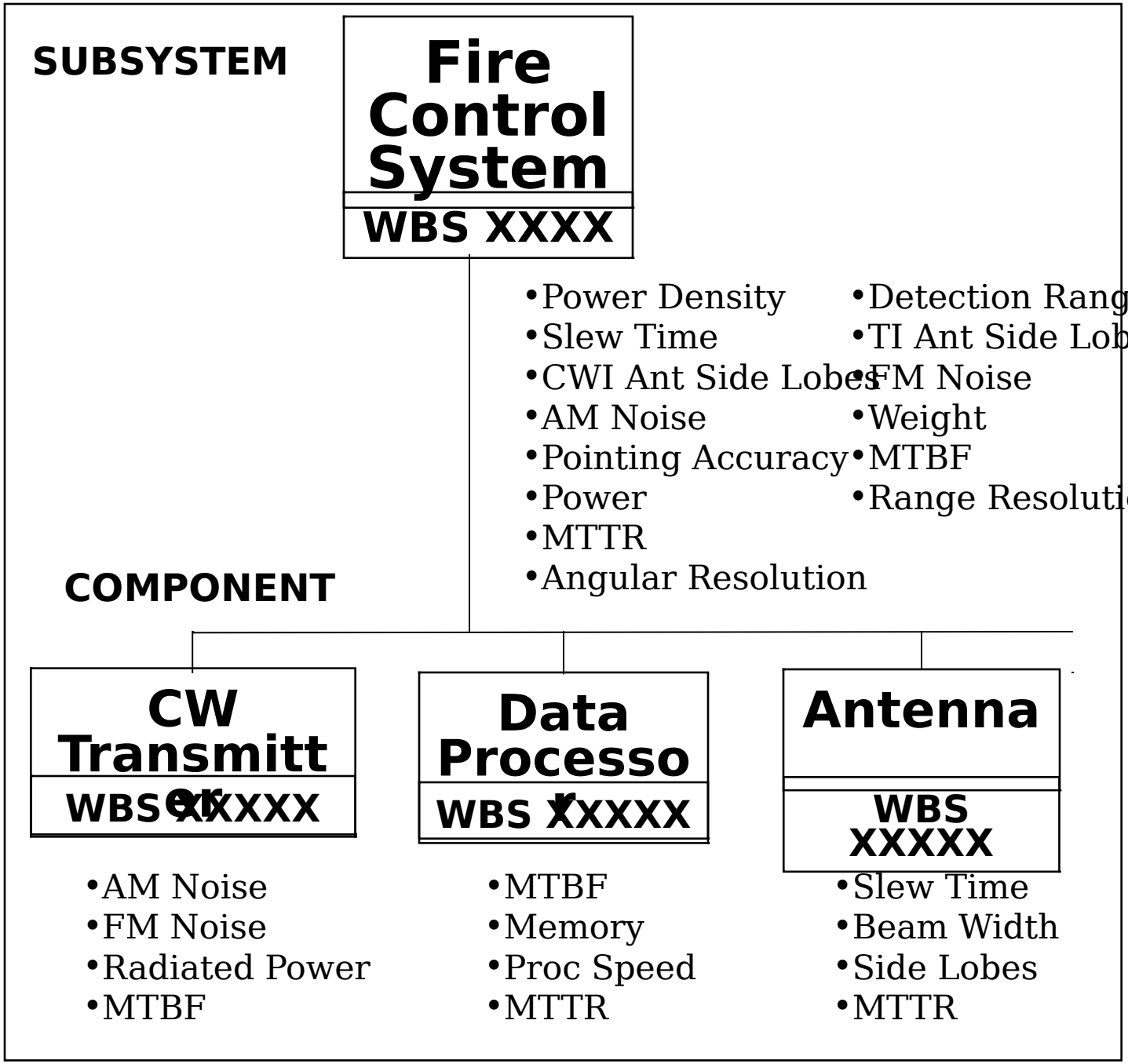
Draft One Book Requirement

- **On major programs, upgrades, and modifications, in the Program Definition and Risk Reduction or Engineering and Manufacturing Development phases of a program, the SPRD&E specialist shall use technical performance measures (TPMs)…**a tool that can be used to monitor technical performance, and may predict negative variances in technical EVMS control accounts.
  - The specialist shall **use supplier TPMs where available**.
  - Otherwise, where applicable, use supplier data to construct TPMs that will provide insight into supplier progress in key performance requirements.
- The EVMS control accounts reflect contract and program requirements that have been flowed down from, and explained in, the Work Breakdown Structure. **The SRPD&E specialist shall be aware of the status of those key technical functions that may negatively impact EVMS control accounts and system performance parameters.**

Selection of Parameters

- **Technical parameters selected for tracking should be critical indicators of technical progress. If the parameter fails to meet specifications/technical thresholds, an adverse impact on a system performance will occur.**
  - High risk items
  - Traceable to the needs of the operational user
  - Visibility into the technical performance of key elements of the work breakdown structure
  - Cost drivers
  - Schedule drivers (lie on the critical path)
- **Parameters must be concrete technical parameters that can be projected and tracked**.

Ideally, the CAO will use the same TPMs that the



- **Sensor resolution**
- **Weight**
- **Gas mileage**
- **Video monitor distortion**
- **Operational availability**
- **Weight**
- **Mean time between failures (MTBF)**
- **Speed**
- **Range**
- **Payload**
- **Product unit cost**
- **Power consumptio**

New DCMC Engineering Metric

- New engineering metric needed
  - Current metrics don’t drive behavior of predictive data analysis and problem solving; lagging metrics
- TPMs will focus efforts on up-front performance requirements
  - TPM is a metric that compares expected technical achievement to actual progress using periodic measurements or tests
- Metric is currently in development